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DEPARTMENT OF COMMERCE - BUREAU OF MINES

CONSUMPTION OF PRIMARY TIN IN THE UNITED STATES DURING 1930[1]

By John B. Umhau[2]

In 1930, 65,448 long tons of virgin or primary tin were consumed by 1,292 establishments in the United States, representing about 91 per cent of the total consumption as computed from imports, exports, and stocks at the beginning and the end of the year. The reported consumption was equivalent to 38 per cent of the world's tin production in 1930, estimated at 171,000 tons, and was 12 per cent less than the 74,369 tons consumed by 1,307 establishments in 1928.

Decreased consumption of new tin in 1930 as compared to 1928 was a reflection of the general industrial depression. All of the tin-consuming industries showed substantial decreases except tin plate and terneplate, white metal, and tinning, which showed small tonnage increases aggregating only 1,200 tons. The largest tonnage decrease was in the use of new tin in babbitt which declined 33 per cent in 1930 as compared to 1928. This was largely attributable to the decreased production of automobiles and trucks, which was 24 per cent lower in 1930 than in 1928. Percentage decreases in other important tin-consuming industries were as follows: Solder 18 per cent, bronze 19 per cent, tin foil 40 per cent, chemicals 23 per cent, tin oxide 44 per cent, and type metal 46 per cent. The distribution of the amount consumed by various uses during 1927, 1928, and 1930 is shown in table 1.

Consumption studies indicate the fact that variation in tin consumption from year to year parallels the fluctuations in demand for the already well-established tin products. For example, the manufacture of motor cars and trucks[3] required only 11,000 tons of tin in 1930 compared to 19,000 tons in 1928; the canning industry continues to require the greater portion of the tin plate and much of the solder. Recently developed industries, while affecting total consumption of bearing metals, solders, etc., to some extent, have made little change in the relative importance of these commodities as consumers of tin.

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1 The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from U. S. Bureau of Mines Information Circular 6564."

2 Common metals division, economics branch, U. S. Bureau of Mines.

3 Facts and Figures of the Automobile Industry: National Automobile Chamber of Commerce, U. S. A., 1931 ed., p. 83 and 1929 ed. p. 13.

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Table 1.- Consumption of primary tin in the United States, by uses, 1927, 1928, and 1930.

Uses	1927		1928 1/		1930	
	Long tons	Per cent	Long tons	Per cent	Long tons	Per cent
Tin plate and terneplate...	24,525	35.96	27,053	36.38	27,753	42.40
Solder	13,602	19.94	13,874	18.66	11,407	17.43
Babbitt	7,595	11.14	8,150	10.96	5,438	8.31
Bronze	4,664	6.85	4,324	5.81	3,499	5.35
Foil	4,193	6.15	5,068	6.81	3,061	4.68
Collapsible tubes	2,710	3.97	2,864	3.85	3,826 2/	5.84
Chemicals	2,621	3.84	4,246	5.71	3,268	4.99
Tin oxide	1,311	1.93	1,183	1.59	666	1.02
Tinning, brass, copper, tubes, sheets or shells, wire, nails, etc.	2,661	3.90	2,636	3.54	2,814	4.30
White metal	849	1.24	802	1.08	1,117	1.71
Type metal	450	.66	411	.55	223	.34
Castings	1,011	1.48	730	.98	743/	.11
Other alloys	556	.81	629	.85	306	.47
Miscellaneous	1,450	2.13	2,399	3.23	1,996	3.05
Total	68,198	100.00	74,369	100.00	65,448	100.00

1/ Revised figures.

2/ Not comparable to prior years owing to the addition of several consumers whose consumption was not included previously.

3/ Pure tin castings only; in previous years some castings of tin alloys were reported under this heading.

The great northeastern and north-central manufacturing belt of the United States in which 75 per cent of the total value of all the products of domestic manufactures is produced, accounts for 97 per cent of the total domestic tin consumption; New York, Pennsylvania, Illinois, Ohio, and Michigan, in this territory, consume over 75 per cent of the total.

Of the 1,292 concerns reporting tin consumption in 1930 only 244 consumed more than 15 long tons (approximately one minimum carload) during the year. Of the balance, 172 individual concerns consumed between 5 and 15 tons each during the year, and the remainder, about two-thirds of the entire number, consumed less than 5 tons in the year. These 1,292 concerns include substantially all the initial tin fabricators through whose plants tin first enters industry; manufacturers who purchase alloys or other tin products for further fabrication were not included.

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TIN PLATE AND TERNEPLATE

The consumption of primary tin for tin plate and terneplate manufacture represents the principal single use for tin in this country, and in 1930 accounted for 27,753 long tons, or 43 per cent of the total consumption, as compared to the 27,053 long tons, or 36 per cent in 1928. This increase, amounting to about 2.6 per cent, is due primarily to increase in the food-packing industry in which the greater portion of the tin plate production is used. This industry was not affected by 1930 drought conditions, as the principal canning crops compared favorably with previous years. Moreover, there was increased demand for tin plate for cans to replenish canner's stocks which were depleted by the large 1929 crop. While some new uses for cans were developed in 1930, there was some falling off in exports, and domestic demand for metal containers for paints, varnish, chemicals, oils, etc. In addition to food containers, tin plate is used in the manufacture of containers for gasoline, oil, tobacco, etc. It is also used in bottle caps, lithographing, decorating, gas meters, lanterns, and kitchenware. Terneplate is used for automobile tanks, fire doors, metal furniture, roofing, and in other articles.

Refrigerated food is being marketed in increasing quantities and is supplying the public with food which otherwise would have been marketed in tin-plated containers. Glass and paper containers are replacing tin cans in the packing of many foods and household supplies, and the attractiveness and utility of these containers are bound to expand their popularity. Nonmetallic products, as well as copper, zinc, and zinc-coated roofing have undoubtedly supplanted much tin plate and terneplate used for roofing, siding, etc.

The new continuous sheet-rolling process for manufacturing black plate, which makes possible the production of tin plate in coiled form, presages a radical change for the can-making industry. The coiled product is used in new automatic high-production presses for making can tops and bottoms. Economies are effected by increased speed of operation and decreased production of scrap. In addition it is expected that tin plate in the form of coils eventually will be made at a lower cost than tin-plate sheets.[4]

SOLDER

Solder, next in importance, required 11,407 long tons of tin, or 17.43 per cent of the total consumption in 1930; compared with the 1928 figures, 13,874 long tons and 18.6 per cent, this was a decrease. The development of "lap-welding" and die stamping tin cans has lessened the demand for solder in canning operations and consequently for much tin. The practice of "wiping" joints with solder, now virtually abandoned on all new construction, has also effected a diminishing demand for solder and hence for tin. Welding, brazing, and silver solders are growing competitors of tin solders. For electrical work, where resistance to high temperatures and vibration is required, silver solders and brazing are replacing some tin solders. Cadmium is also proving to be a satisfactory substitute for tin in some solders. "Amaloy," a recently introduced solder containing 98 per cent of lead and only 1 per cent or less of tin, is also curtailing the use of tin in solder.

4 Crane, E. V., Progress in Pressed Metal: Iron Age, vol. 125, No. 1, Jan. 2, 1930, p. 40.

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It is of interest that 25 per cent of the concerns using tin for solders also use tin for making babbitt and bronze.

BABBITT AND BRONZE

The manufacture of babbitt required 5,438 long tons or 8.31 per cent of the total for 1930. This was approximately 33 per cent less than the 8,150 long tons consumed in 1928. The consumption of tin in the manufacture of bronze decreased 19 per cent in 1930, the amounts consumed being 3,499 long tons or 5.35 per cent of the total in 1930, and 4,323 or 6 per cent of the total in 1928.

Babbitt and bronze bearings are now being replaced by roller and ball bearings. It is notable that within the past year the first locomotive ever constructed in this country completely equipped through-out with antifriction-type roller bearings was placed in service.[5] The production of babbitt and bronze was adversely affected by the marked decrease in the production of automobiles and trucks in 1930.

FOIL AND COLLAPSIBLE TUBES

The use of tin in tinfoil decreased from 5,068 tons in 1928 to 3,061 tons in 1930, a decline of 40 per cent. In 1930 the use of tin in foil amounted to less than 5 per cent of the total tin consumption, whereas in 1928 it was nearly 7 per cent. The use of tin in collapsible tubes in 1930 amounted to nearly 6 per cent of the total. The 1930 figure includes tin consumed by 5 manufacturers whose consumption is not included in the 1928 figure; hence the two figures are not comparable. Consumption by the concerns reporting for both years shows a decline in this use of tin.

In the collapsible tube and foil industry aluminum has become a potent competitor of tin, and it has been reported recently that nearly pure zinc, refined electrolytically, shows pronounced ductility and has been used for making collapsible tubes and foil. A transparent cellulose produce "cellophane," which may be had in various colors for wrapping confections, etc., has recently appeared as a substitute for foil.

CHEMICALS

There was a decided decrease in the use of tin for the manufacture of tin oxide and other chemicals. One cause for this decrease was the decline in silk consumption in 1930. Considerable tin in the form of "bichloride," "tin salts," "tin crystals," and "stannous chloride" is used in the manufacture of silk fabrics. Tin oxide is largely used as a constituent of the enamel applied to cooking utensils, refrigerators, and sanitary ware. Zirconium oxide, which is cheaper, is being substituted for some tin oxide by many manufacturers; a mixture of 6 parts tin oxide and 4 parts zirconium oxide is used. Japanning of the small cheaper articles, lacquer finishes on refrigerators, and the vitreous china used for sanitary ware instead of vitreous enamels are all factors which tend ultimately to replace considerable tin.

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5 Blast Furnace and Steel Plant, Locomotive Equipped with Roller Bearings; Vol. 18, No. 7, July, 1930, p. 1147.

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TINNING

Concerns using tin for tinning accounted for 2,814 long tons of tin in 1930 and 2,636 tons in 1928. Over 90 per cent of the total tin used for tinning in 1930 was consumed as follows:

	Long tons
Tinning wire	1,073
Equipment used in food preparation	706
Tubes, sheets and shells	485
Brass and bronze	103
Iron castings	64
Retinning	55
Connecting rods and babbitting	48
Rivets and pipe threads	8

Smaller quantities are used for harness, steel drums, toys, etc.

Tin amounting to 1,098 long tons in 1928 and 1,265 long tons in 1917 was accounted for as being used for tinning wire. In 1928, only 312 long tons of tin was reported for tinning utensils used in food preparation.

Aluminum cooking utensils have eliminated much tin formerly used in tinning and retinning cooking utensils.

WHITE METAL

In 1930 tin used for white metal amounted to 1,117 long tons, a gain of 39 per cent over the 802 tons used in 1928. Of the 1930 total, 434 tons was reported used in Britannia metal and 123 tons in pewter.

OTHER ALLOYS

Tin used for "other alloys" accounted for only 306 long tons in 1930 as compared with 629 tons in 1928. Included in the total for this item in 1930 are 20 tons used for cable sheathing, which accounted for 37 tons in 1928. Only 10 tons of tin was used in organ-pipe metal in 1930, whereas 21 tons was used in 1928, and 24 tons in 1917. For fusible plugs about 6 tons of tin was used in 1930, compared to 8 tons in 1928. The tin used in the manufacture of special metal products such as bolster metal, dental alloys, aluminum alloys, die metal, shot, phosphor tin, ounce, and needle metal is included in the item "other alloys."

CASTINGS OF PURE TIN

Only 74 long tons of tin were used for castings of pure tin in 1930, whereas in 1928 this item indicated the use of 730 long tons. These figures are not comparable by reason of changes made in the method of collecting data.

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Heretofore it was difficult to obtain satisfactory data from the consumers concerning the use of tin for castings and it was thought that the greater portion of the tin reported as being used for castings was actually used as an ingredient of bronze or other alloy castings. The 1930 questionnaire asked specifically "how much tin was used for castings of pure tin."

MISCELLANEOUS USES

Miscellaneous uses accounted for 1,996 long tons or 3 per cent of the total tin consumed in 1930 as compared to over 2,400 tons in 1928. Among the uses included under this heading is zinc coating (galvanizing) which consumed 107 tons in 1930, 133 tons in 1928, and 105 tons in 1917. Pure tin tubing, pipe, sheet, wire, and related articles required 1,075 long tons in 1930; and bottle caps, stoppers, covers, and sprinkler tops, 18 long tons.

Other articles which the consumers reported under this item in 1930 include hollow ware, cutlery and spoons, smokeless powder and small arms ammunition, pattern work, dust or powder, calf muzzles, hammers, diaphrams, and wire rakes. In addition, during 1928 they reported miscellaneous uses as follows:

Tinning mixture, tin bearings.
Rubber industry.
Lining of soda-fountain tanks.
Bars.
Ball-bearing parts.
Wiring and stamping.
Tin ribbon, tin tubing, tin bar.
Valve seats.
Torches
R. R. bond terminals.
Trolley wheels, banjo rings, etc.
Shelving.
Terneplating conductor hooks.
Building up piston heads.
Metallic packing.
Repair work.
Elbows.

CONSUMERS STOCKS OF TIN

Stocks of tin held by domestic consumers increased from 10,606 long tons on January 1, 1930, to 15,500 tons at the end of the year (December 31, 1930), a net increase of 4,894 tons. During 1928 stocks declined from 9,268 tons at the beginning of the year to 8,587 tons at the end of the year, a net draft of 681 tons. The increase in stocks during 1930 was probably due to the desire of manufacturers to take advantage of the low prices prevailing.

Table 2 shows the stocks of tin held and quantity of tin used by manufacturers groupsed according to their principal product.

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Table 2.- Tin stocks in hands of consumers manufacturing specified commodities, 1928 and 1930

(Long tons)

Manufacturers of:	Number of manufacturers		Tin used		Stocks			
					1928		1930	
	1928	1930	1928	1930	Jan.1	Dec.31	Jan.1	Dec.31
Tin and terne plate, or tin and terne plate and other products	16	16	28,778	29,320	5,190	4,337	5,809	8,866
Solder, or solder and other products	116	129	17,067	14,679	1,438	1,523	2,135	3,319
Babbitt, or babbitt and other products	96	76	6,000	2,875	266	275	85	244
Bronze, or bronze and other products	537	643	3,522	2,775	331	314	487	610
White metal, type metal, and other alloys; or white metal, type metal, other alloys, and other products	119	104	1,102	1,054	105	66	82	179
Castings, or castings and other products	102	6	1,247	15	115	123	14	13
Foil, or foil and other products	9	6	4,979	3,231	625	616	99	141
Tubes, or tubes and other products	9	15	2,837	3,773	207	225	459	724
Tinned wares and other products	139	162	1,965	2,520	300	345	653	699
Chemicals and other products	15	27	5,413	3,916	475	575	595	509
Miscellaneous	149	108	1,459	1,290	163	135	188	196
For all purposes	1,307	1,292	74,369	65,448	9,215	8,534	10,606	15,500

CONSUMPTION OF SECONDARY TIN

The United States Bureau of Mines has canvassed the tin-consuming industries to obtain data on the amount of secondary tin used in 1928 and 1930, but inquiry has revealed that some consumers had inadvertently reported less than the actual amount of secondary tin consumed in their plants. It has, therefore, been deemed advisable to withhold publication of the 1930 canvass.

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